Journal of Strategic Information Systems 26 (2017) 191–209

Contents lists available at ScienceDirect

Journal of Strategic Information Systems

journal homepage: www.elsevier.com/locate/jsis

Debating big data: A literature review on realizing value from big data

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ARTICLE INFO

Article history:
Available online 14 August 2017

Keywords:
Big data
Analytics
Literature review
Value realization
Portability
Interconnectivity

ABSTRACT

Big data has been considered to be a breakthrough technological development over recent years. Notwithstanding, we have as yet limited understanding of how organizations translate its potential into actual social and economic value. We conduct an in-depth systematic review of IS literature on the topic and identify six debates central to how organizations realize value from big data, at different levels of analysis. Based on this review, we identify two socio-technical features of big data that influence value realization: portability and interconnectivity. We argue that, in practice, organizations need to continuously realign work practices, organizational models, and stakeholder interests in order to reap the benefits from big data. We synthesize the findings by means of an integrated model.

1. Introduction

Big data has gained significant impetus as a breakthrough technological development (Fichman et al., 2014) in academic and business communities (Chen et al., 2012). Big data can be defined based on large *volumes* of extensively *varied* data that are generated, captured, and processed at high *velocity* (Laney, 2001). As such, these data are difficult to process using existing technologies (Constantiou and Kallinikos, 2015). By adopting advanced analytics technologies, organizations can use big data for developing innovative insights, products, and services (Davenport et al., 2012).

The opportunities arising from big data analytics[1] for organizations are considered pivotal: big data has been described as, "the mother lode of disruptive change in a networked business environment" (Baesens et al., 2014, p. 629). By adopting big data technologies, organizations expect to gain benefits across many domains, such as e-commerce, e-government, science, health, and security (Chen et al., 2012). What benefits organizations perceive as "value" depends on their strategic goals for adopting and using big data (Ghoshal et al., 2014).

In this paper, we refer to both social and economic value. Social value includes improved social wellbeing in fields such as education (Cech et al., 2015), healthcare (Raghupathi and Raghupathi, 2014), and public safety and security (Newell and Marabelli, 2015). Governments, for instance, can use big data to, "enhance transparency, increase citizen engagement in public affairs, prevent fraud and crime, improve national security, and support the wellbeing of people through better education and healthcare" (Kim et al., 2014, p. 81). Thus, social value comprises benefits for single users as well as larger societal benefits such as employment growth, productivity, and consumer surplus (Loebbecke and Picot, 2015).

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[1] We consider "analytics" to be a part of processing the data and one of the potential first steps in trying to realize value from big data.

http://dx.doi.org/10.1016/j.jsis.2017.07.003
0963-8687/

Economic value can be measured by an organization's increase in profit, business growth, and competitive advantage resulting from big data adoption (Davenport, 2006; Davis, 2014; Tyagi, 2003). Economic value often comprises monetary benefits that are appropriated by organizations. For example, organizations that rely on big data to guide organizational strategies and day-to-day operations are expected to perform better financially than organizations that do not (LaValle et al., 2011; McAfee and Brynjolfsson, 2012).

In general, big data is perceived as a source of innovative products, services, and business opportunities (Davenport et al., 2012; Davenport and Kudyba, 2016; McAfee and Brynjolfsson, 2012). Moreover, big data is believed to result in more efficient and effective operations by, for example, optimizing supply chain flows; setting the most profitable price for products and services; selecting the right people for certain tasks and jobs; minimizing errors and quality problems, and improving customer relationships (Chen et al., 2012; Davenport, 2006; McAfee and Brynjolfsson, 2012). Additionally, further economic and social value can be gained from big data through enhanced decision making (Sharma et al., 2014) and more informed strategizing (Constantiou and Kallinikos, 2015).

Thus, both the academic and practitioner-oriented literatures are characterized by a strong focus on the opportunities that big data provides for organizations (Clarke, 2016). However, high hopes and extensive publicity regarding big data do not guarantee the gaining of actual value, and may lead organizations to believe they can gain more value from big data than they are actually able to realize in practice (Ransbotham et al., 2016; Ross et al., 2013). Because initial discussions about the phenomenon are characterized by ungrounded optimism[2] (Arnott and Pervan, 2014), we need to analyze how organizations translate, as well as fail to translate, its potentials into actual social and economic value (Markus and Topi, 2015). Specifically, we are in need of research that analyzes what strategies organizations create to realize value from big data.

In our study, we performed a review of IS literature that discusses organizational changes, drivers, and actions related to big data value realization at different levels of analysis. We respond to the call for focusing on the tensions organizations face in realizing value from big data (Galliers et al., 2015). Our contribution is threefold. First, we identify a total of six debates central to how organizations realize value from big data, at the work-practice, organizational, and supra-organizational levels. We call for empirical studies to show when, if, and how the opposing positions of each debate are relevant. Second, we identify portability and interconnectivity as two socio-technical features that influence how organizations realize value from big data in practice. Third, we argue that to advance theories on big data value realization, the IS field is in need of empirical studies that show how cross-level interactions play a role when organizations realize value from big data. As such, our study extends recent calls for research on the implications of big data use by organizations (e.g., George et al., 2014; Markus and Topi, 2015).

In the remainder of the paper, we begin by describing the methods used to conduct an in-depth systematic literature review. This will be followed by our findings, which we structured around six active debates in the big data literature, at the work-practice, organizational, and supra-organizational levels. Subsequently, we ask what features of big data shape value realization in the context of big data. Finally, we examine cross-level interactions and propose an integrated model that synthesizes our findings.

2. Methods

We performed an in-depth systematic literature review (Webster and Watson, 2002; Jones and Gatrell, 2014) focused on identifying active debates and generating detailed insights into the meaning of these debates. The review consists of search, selection, analysis, and synthesis processes. Our aim was to provide an in-depth analysis of the field rather than providing a descriptive overview (Jones and Gatrell, 2014).

2.1. Search and selection

We aimed to arrive at a set of papers that (1) focus on the adoption, implementation, or use of data (analytics) technologies *by organizations*, and (2) have specifically mentioned the term "big data" in the title, abstract, keywords, or body of the paper.

We began our review by searching within the AIS "basket of eight" IS journals.[3] To account for recent studies that had not as yet been published at the time of searching, we also examined the proceedings of three leading IS conferences: ICIS, ECIS, and AMCIS.[4] To expand our scope and check our coverage, we searched a number of additional IS journals and key journals from the fields of management and organization (see Appendix A, Table A.1). However, the majority of papers that met our criteria appeared in IS journals and the proceedings of the above conferences, indicating that the discussion thus far resides within the IS community for the most part. We considered papers available since 2000, given that this is when large volumes of unstructured data gained momentum (Chen et al., 2012), and up

[2] Receiving tremendous positive attention is typical for "IT hypes and fashions" in their initial stages (Wang, 2010; Swanson, 2012). This emphasizes the need for a critical reflection on how organizations realize value from big data in practice.

[3] http://aisnet.org/?SeniorScholarBasket, accessed 14-11-2014.

[4] ICIS: http://aisel.aisnet.org/icis/; ECIS: http://aisel.aisnet.org/ecis/; AMCIS: http://aisel.aisnet.org/amcis/.